Amendments to the Specification:

Please amend the Specification as follows:

Please amend the paragraph beginning at page 1, line 27 as follows:

~~The conventional~~ Conventional automotive restraint and [[30]] protection ~~apparatuses~~ apparatus include a type provided with a seatbelt retractor for retracting or winding a seatbelt. The seatbelt retractor is generally provided with bias force-imparting means such as a spiral spring which always biases a reel shaft (takeup shaft) on which the seatbelt is wound, in a retracting or winding direction. The seatbelt is wound up on the reel shaft due to the bias force ~~given~~ provided by the bias force-imparting means when [[it]] the seatbelt is not mounted on the occupant, and [[it]] is protracted or withdrawn against the bias force to fasten or restrain the occupant when [[it]] the seatbelt is mounted on the occupant.

Please amend the paragraph beginning at page 2, line 16 as follows:

According to the conventional automotive passenger restraint and protection apparatus, however, to mount the seatbelt onto the occupant, [[he]] the occupant has to protract the seatbelt

against the bias force of the bias force-imparting means, which requires the occupant to exert some force to protract the seatbelt. As a result, a weak occupant who has degraded physical ability, such as [[an]] that which occurs with advanced-age, ~~occupant~~ takes a long time to mount the seatbelt onto his body.

Please amend the paragraph beginning at page 15, line 4 as follows:

To attain the first object, according to a third aspect of the invention, the automotive passenger restraint and protection apparatus according to the first aspect includes seatbelt locking means for locking the seatbelt from being protracted when the seatbelt is protracted at a predetermined or high degree of acceleration, and wherein the control means controls the driving means to thereby control the speed of protraction or retraction of the seatbelt. [[at]] At least one of the conditions is satisfied [[that]] when the driving means stops retracting driving of the seatbelt, the driving means starts protracting driving of the seatbelt from a stopped state of the seatbelt, [[and]] or the driving means shifts from the retracting driving of the seatbelt to protracting driving of the seatbelt.

Please amend the paragraphs beginning at page 17, line 35 to page 18, line 33 as follows:

According to the seventh aspect, when the limit of retraction of the seatbelt has been detected, the retraction of the seatbelt is stopped from being retracted by the driving means, and then the seatbelt is protracted for a predetermined time period by the driving means. As a result, the seatbelt is [[give]] <u>given</u> a predetermined amount of looseness without fail, <u>thus</u> eliminating the disadvantage with the conventional automotive passenger restraint and protection apparatus [[that]] <u>where</u> the occupant is given a feeling of oppression by the seatbelt mounted on his body and feels uncomfortable[[, whereby]]<u>. Therefore,</u> a comfortable seatbelt attaching environment is provided.

To attain the fifth object, according to an [[eight]] <u>eighth</u> aspect of the invention, there is provided an automotive passenger restraint and protection apparatus for an automotive vehicle, having a seatbelt, for restraining an occupant of the automotive vehicle by the seatbelt to protect the occupant, comprising an electric retractor having driving means for retracting and protracting the seatbelt, control means for

controlling the driving means, seatbelt attaching detecting means for detecting whether the seatbelt is attached to the occupant or disconnected from the occupant, retraction limit detecting means for detecting whether the seatbelt has been retracted to a limit thereof, wherein the control means controls the driving means in a manner such that when the seatbelt attaching detecting means detects that the seatbelt has become attached to the occupant from a state in which it is disconnected from the occupant, the seatbelt is retracted, and when the retraction limit detecting means subsequently detects that the seatbelt has been retracted to the limit thereof, the seatbelt is stopped from being retracted.

Please amend the paragraph beginning at page 35, line 13 as follows:

To attain the tenth object, according to a twenty-fifth aspect of the invention, there is provided an automotive passenger restraint and protection apparatus for an automotive vehicle, having a seatbelt, for restraining an occupant of the automotive vehicle by the seatbelt to protect the occupant, comprising PWM (pulse width modulation) signal generating means for generating a PWM signal, a motor for retracting and

protracting the seatbelt, the motor having operation thereof controlled by the PWM signal generated by the PWM signal generating means, and determining means for detecting at least one of current flowing to the motor and terminal voltage across the motor and for determining a state of the operation of the motor, based upon the detected at least one of the current and the terminal voltage, the determining means having low-pass filter means having a predetermined cutoff frequency lower than a frequency of the PWM signal, wherein the determining means causes the filter means to reduce higher frequency components than the predetermined cutoff frequency, contained in the at least one of the current and the terminal voltage, and determines the state of the operation of the motor, based upon the at least one of the current and the terminal voltage having the higher frequency components reduced.

Please amend the paragraphs beginning at page 42, line 19 as follows:

Fig. 15 is a flowchart showing buckle attaching control ~~executed at a step S1702 in Fig. 7~~ according to the second embodiment;

Fig. 16 is a flowchart showing control of warning of collision and determination of unavoidableness of collision, and warning of doze ~~executed at a step S1703 in Fig. 7~~;

Fig. 17 is a flowchart showing movement control ~~executed at a step S1704 in Fig. 7~~;

Fig. 18 is a flowchart showing a continued part of the Fig. [[21]] 17 control;

Fig. 19 is a flowchart showing a mode selecting control ~~executed at a step S1705 in Fig. 7~~;

Fig. 20 is a flowchart showing seatbelt storing control ~~executed at a step S1707 in Fig. 7~~;

Fig. 21 is a flowchart showing seatbelt protraction control according to the third embodiment executed by the MPU 14 during protraction of the seatbelt;

Please amend the paragraphs beginning at page 43, line 3 as follows:

Fig. 23 is a graph showing, by way example, the relationship between terminal voltage V of a DC motor [[10]] and elapsed time;

Fig. 24 is a view showing an example of a seat inside a vehicle compartment according to a fourth embodiment;

Please amend the paragraph beginning at page 44, line 14 as follows:

Fig. 39 is a flowchart showing seatbelt attaching control according to an eighth embodiment executed by the MPU 14 in attaching the seatbelt;

Please amend the paragraph beginning at page 44, line 23 as follows:

Fig. 41 is a circuit diagram showing the configuration of a DC motor driver 47 according to a ninth embodiment;

Please amend the paragraph beginning at page 44, lines 34 as follows:

Fig. 44 is a flowchart showing seatbelt attaching control executed by the MPU 14 in attaching the seatbelt according to a tenth embodiment;

Please amend the paragraph beginning at page 45, line 8 as follows:

Fig. 46 is a flowchart showing seatbelt attaching control executed by the MPU 14 in attaching the seatbelt according to an eleventh embodiment;

Please amend the paragraphs beginning at page 45, line 16 as follows:

Fig. 48 is a timing chart showing the relationship between the driving force of the reel shaft 3 for retracting the seatbelt and the seatbelt retracting speed of the reel shaft 3 according to a twelfth embodiment;

Fig. 49 is a flowchart showing seatbelt looseness imparting control according to a thirteenth embodiment;

Please amend the paragraphs beginning at page 46, line 27 as follows:

Fig. 64 is a flowchart showing a fault diagnostic program executed by the MPU 14, which corresponds to a method (a), according to an eighteenth embodiment;

Fig. 65 is a flowchart showing a fault diagnostic program executed by the MPU 14, which corresponds to a method (b) ~~continued part of the Fig. 64 control~~;

Fig. 66 is a flowchart showing a fault diagnostic program executed by the MPU 14, which corresponds to a method (c), according to a nineteenth embodiment ~~further continued part of the Fig. 64 control~~;

Fig. 67 is a graph showing the relationship between the duty ~~factor~~ ratio of a control signal and time elapsed after outputting of the control signal;

Please amend the paragraphs beginning at page 47, line 3 as follows:

Fig. 69 is a graph showing the relationship between the duty ~~factor~~ ratio of a control signal and time elapsed after outputting of the control signal.

Fig. 70 is a flowchart showing a control program executed by the MPU 14 in attaching and disconnecting the seatbelt according to a twentieth embodiment;

Please amend the paragraphs beginning on page 47, line 11 as follows:

Fig. 72 is a block diagram showing contents of arithmetic processing executed by the MPU 14 ~~provided in an electric retractor 2100~~ according to a twenty-first embodiment;

Fig. 73 is a [[is a]] block diagram showing contents of arithmetic processing executed by the MPU 14 according to a twenty-second embodiment;

Fig. 74 is a [[is a]] block diagram showing contents of arithmetic processing executed by the MPU 14 according to a twenty-third embodiment;

Fig. 75 is a circuit diagram showing the construction of an automotive passenger restraint and protection apparatus according to [[a]] twenty-fourth and twenty-sixth embodiments ~~embodiment~~ of the invention;

Please amend the paragraphs beginning on page 47, line 26 as follows:

Fig. 77 is a timing chart showing the relationship between ON/OFF states of the ignition switch 79 and the duty ~~factor~~ ratio of a control signal delivered to the DC motor driver 11 after

release of the seatbelt tongue from the buckle according to a twenty-fifth embodiment;

Fig. 77A is a graph showing a change in the duty ~~factor~~ ratio of the control signal supplied to the DC motor driver 11 after release of the seatbelt tongue from the buckle to the time 3 seconds elapses;

Please amend the paragraph beginning at page 50, line 5 as follows:

The MPU 14 controls the operative state of the DC motor 10 by changing the duty ~~factor~~ ratio of a PWM (Pulse Width Modulation) signal for use in the control, for example. The MPU 14 detects current flowing to the DC motor 10 or terminal voltage across the DC motor 10 for the control of the DC motor 10. The duty ~~factor~~ ratio of the PWM signal is determined based upon detected current flowing to the DC motor 10 or detected terminal voltage across the DC motor 10.

Please amend the paragraph beginning at page 50, line 25 as follows:

Fig. 2 is a circuit diagram showing the construction of the DC motor driver 11. In Fig. 2, reference numerals P1 and P2 designate input terminals for a PWM (Pulse Width Modulation) signal output from the MPU 14, which has a frequency of 20 kHz, for example. Reference numerals P3 and P4 designate output terminals for detecting current, and P5 and P6 output terminals for detecting voltage, the terminals P1 to P6 being connected to the MPU 14. Supply voltage from a battery Vb shown in Fig. 2 is supplied to the DC motor 10. A plurality of transistors and FETs <u>(Field Effect Transistors)</u> appearing in Fig. 2 are for selectively causing the DC motor 10 to be normally rotated or reversely rotated in response to the PWM signal from the MPU 14. More specifically, the DC motor driver 11 is constructed such that if a high-level control signal is delivered through the terminal P1 from the MPU 14, the DC motor 10 is rotated in the normal direction, whereby the seatbelt is retracted by the reel shaft 3, while if a high-level control signal delivered through the terminal P2 from the MPU 14, the DC motor 10 is rotated in the reverse direction, whereby the seatbelt is protracted by the reel shaft 3. The MPU 14 controls such that the high-level control signal is not applied to the terminals P1 and P2 at the same time.

Please amend the paragraph beginning at page 52, line 17 as follows:

First, when the PWM signal having a duty ~~factor~~ ratio of 50 % and a frequency of 20 kHz as shown in Fig. 3A is input through the terminal P1 or P2, the voltage signal output through the terminal P5 has high maximal voltage v due to the influence of the PWM signal input through the terminal P1 or P2, as shown in Fig. 3B, if the low-pass filter IF3 is not provided.

Please amend the paragraph beginning at page 60, line 18 as follows:

According to the seatbelt attaching control described above, after the attaching of the seatbelt tongue to the buckle, the seatbelt is retracted, and after the retraction of the seatbelt has reached it limit, the seatbelt starts to be protracted to be given a predetermined amount of looseness. As a result, the inconvenience with the conventional automotive passenger restraint and protection apparatus, such that the seatbelt mounted on the occupant's body always gives the occupant a feeling of oppression owing to the bias force of the bias force-imparting means and makes him uncomfortable can be eliminated

~~that the seatbelt mounted on the occupant's body always gives the occupant a feeling of oppression owing to the bias force of the bias force-imparting means and makes him uncomfortable~~.

Please amend the paragraph beginning at page 63, line 17 as follows:

Then, the terminal voltage across the DC motor 10 and the sign of the same are measured by the circuit C2 of the DC motor driver 11 [[are]] at a step S806, and it is determined at a step S807 whether the measured terminal voltage exceeds a predetermined value (e.g. 0.1 volts) and the sign corresponds to the direction of ~~retracting~~ retraction of the seatbelt. The answer to this question is affirmative (YES) if the occupant has returned to his original position after moving and accordingly the seatbelt has been retracted by the bias force-imparting means formed of a spiral spring or the like.

Please amend the paragraph beginning at page 63, line 28 as follows:

If the answer to the question of the step S807 is affirmative (YES), the MPU 14 delivers a control signal commanding to rotate the reel shaft 3 in the seatbelt retracting direction to the DC motor driver 1 at step S810[[)]]. Thus, the seatbelt is retracted.

Please amend the paragraph beginning on page 71, line 19 as follows:

Fig. 13 is a flowchart showing the seatbelt retraction failure detecting control executed at the step [[S4098]] <u>S409</u> in Fig. 4.

Please amend the paragraph beginning at page 72, line 3 as follows:

If the elapsed time t does not exceed the predetermined time period, it is judged that the retraction of the seatbelt is being carried out normally, followed by terminating the present processing, whereas if the former exceeds the latter, it is judged that the retraction of the seatbelt is being carried out abnormally, and the supply of supply voltage to the DC motor from

the battery Vb is stopped ~~at a step S1200~~, to stop the retraction of the seatbelt, followed by terminating the present processing.

Please amend the paragraph beginning at page 73, line 30 as follows:

The reel shaft [[3]] 303 has a central shaft [[3a]] 303a coupled to a central shaft of a retraction stopping gear 304, which is rotatable in the same direction as the reel shaft [[3]] 303, and has an outer periphery thereof formed with a predetermined number of outer teeth. The gear 304 has a teeth surface facing in the seatbelt retracting direction which extends almost normally to the seat belt, and a teeth surface facing in the seatbelt protracting direction which extends at a gentle inclination relative to the seatbelt.

Please amend the paragraph beginning at page 74, line 25 as follows:

The mode selector [[18]] 318 delivers an output signal correpsonding to the selected mode to the MPU 14, which in turn delivers a control signal corresponding to the selected mode to

the DC motor driver 11 and the solenoid driver 317 to control the seatbelt retractor 300.

Please amend the paragraph beginning at page 75, line 5 as follows:

Fig. 15 is a flowchart of buckle attaching control ~~according to the present embodiment executed at the step S402 in Fig. 4~~. The buckle attaching control according to the present embodiment is distinguished from the one (Fig. 6) according to the first embodiment only in that a step [[S1511]] <u>S1509</u> is added.

Please amend the paragraph beginning at page 75, line 23 as follows:

Fig. 16 is a flowchart showing the collision warning, collision unavoidableness and doze warning control according to the present embodiment ~~executed at the step S403 in Fig. 4~~. This control is distinguished from the above described control of Fig. 7 only in that steps S1611 to S1613 are added.

Please amend the paragraph beginning at page 76, line 25 as follows:

Figs. 17 and 18 are flowcharts showing the movement control ~~according to the present invention executed at the step S404 in Fig. 4~~. The movement control according to the present embodiment is distinguished from the movement control of Figs. 8 and 9 according to the first embodiment only in that steps S1720 and S1721 are added.

Please amend the paragraph beginning at page 77, line 15 as follows:

Fig. 19 is a flowchart showing the mode selecting control ~~according to the present embodiment executed at the step S405 in Fig. 4~~. This control is distinguished from the mode selecting control of Fig. 10 according to the first embodiment only in that steps S1018 and S1019 are added.

Please amend the paragraph beginning at page 78, line 5 as follows:

Fig. 20 is a flowchart showing the seatbelt storing control ~~according to the present embodiment executed at the step S408 in Fig. 4~~. This control is distinguished from the seatbelt storing control of Fig. 12 according to the first embodiment only in that a step S1208 is added and the step S1203 in Fig. 12 is replaced by a step S1209.

Please amend the paragraph beginning at page 81, line 31 as follows:

If it is determined at the step S2111 that the change amount ΔV obtained at the step S2110 is smaller than the predetermined amount, that is, the protraction of the seatbelt is not being carried out by the occupant, the time j is incremented by 1 at a step S2115, and it is determined at a step S2116 whether the time j exceeds a predetermined value (e.g. 200 - <u>a threshold value of the time j)</u>. If the time j does not exceed 200, the determination of the step S2113 is executed, while if the former exceeds the latter, the time j is reset at a step S2117, and a control signal ~~commanding~~ to stop the driving of the DC motor 10 is delivered to the DC motor driver 11 at a step S2118, followed by the processing proceeding to the seatbelt storing control

which is identical with the aforedescribed seatbelt storing control employed by the first embodiment and hence not described here.

Please amend the paragraph beginning at page 83, line 27 as follows:

The seat 34 has one lateral side edge thereof provided with a buckle 36 secured to the seat for connecting with a tongue 35 of a seatbelt. At the opposite lateral side of the seat 34, one end of the seatbelt is fixed to a chassis of the vehicle by attaching means. When the tongue 35 is attached to the buckle [[35]] 36, the seatbelt restrains and protects the occupant by a shoulder portion 32 and a lap portion 33 thereof. The seatbelt is retracted by the electric retractor 100 through the tongue 35 and a through portion 31 thereof.

Please amend the paragraph beginning at page 88, line 23 as follows:

If it is determined at the step S3007 that the predetermined time period ts has elapsed, the time period ts is set for the

next time of control at a step S3020, and the count value N is incremented by 1 at the step [[S3009]] S3021, followed by the proceeding to the step S3014.

Please amend the paragraph beginning at page 92, line 29 as follows:

Fig. 30 is a flowchart showing the time interrupt processing.

Please amend the paragraph beginning at page 93, line 6 as follows:

On the other hand, if attaching of the seatbelt has been detected, it is determined at a step S3505 whether an output signal from the collision predictor 25 has been received, which indicates that a collision of the vehicle is unavoidable. If the output signal has been received, the PWM signal is delivered to the DC motor driver 11 over a predetermined time period t6 (e.g. 4 sec) which is measured by the timer 23, to rotate the DC motor 10 in the seatbelt retracting direction at a step S3506. Thus, the occupant can be properly protected in the event of a

collision of the vehicle. Then, the timer interrupt is made effective at a step S3507, and the processing proceeds to the step [[S3404]] S3304.

Please amend the paragraph beginning at page 97, line 5 as follows:

If it is determined at the step [[S306]] S3706 that the vehicle speed v is below the predetermined value v1, the processing proceeds to the step S3710. Thus, when the occupant once stops the vehicle and then slouches to look right and left ways for safety so that the seatbelt is protracted, the retraction of the seatbelt is inhibited, whereby it is possible to allow the occupant to ascertain the safety without being given a sense of unnaturalness.

Please amend the paragraph beginning at page 101, line 18 as follows:

Fig. 37 shows, by way of example, criteria of judgment employed by the danger determining device 43. A reference value of time before collision in the figure is set to 5 ~~second~~

seconds, for example. If the time before collision is equal to or longer than 5 seconds, it is represented as "long", and if the time before collision is below 5 seconds, it is represented as "short". If the output signal from the doze detector 46 indicates a possibility of driving asleep, the possibility of doze is represented as "[[high]] large", while if the output signal indicates that there is no possibility of driving asleep, the possibility of doze is represented as "[[low]] small". Based on the above criteria, the danger determining device 43 judges that the degree of danger is "zero" if the time before collision is "long" and at the same time the possibility of doze is "low", judges that the degree of danger is "low" if the time before collision is "long" and at the same time the possibility of doze is "high", judges that the degree of danger is "low" if the time before collision is "short" and at the same time the possibility of doze is "low", and judges that the degree of danger is "High" if the time before collision is "short" and at the same time the possibility of doze is "high".

Please amend the paragraphs beginning at page 102, line 7 as follows:

Figs. 38A, 38C and 38E are views showing how the DC motor 10 is driven when the degree of danger is determined to be "low" at the danger degree determining device 43. Figs. 38B, 38D and 38F are views showing how the DC motor 10 is driven when the degree of danger is determined to be "high" at the danger degree determining device 43. The driving of the DC motor 10 is controlled by the PWM signal ~~delivered from~~ provided by the MPU 14 to the DC motor driver 11.

The driving of the DC motor 10 is controlled by the PWM signal as follows: (1) Provided that when the danger degree determining device 43 judges that the degree of danger is "low" (Fig. 38A), normal rotative driving and reverse rotative driving of the DC motor 10 are effected at a rate of 10 times per second, for example, (2) Provided that when the device 43 judges that the degree of danger is "high" (Fig. 38B), normal rotative driving and reverse rotative driving of the DC motor 10 are effected at a rate of 20 times per second, for example. In this manner, as the degree of danger ~~is higher~~ increases, the frequency of normal rotative driving and reverse rotative driving of the DC motor 10 is increased so that retraction and protraction of the seatbelt are carried out more frequently to thereby enable ~~alerting~~ the occupant to be sufficiently alerted to the danger ~~sufficiently~~.

As a variation, the driving of the DC motor 10 may be controlled by the PWM signal as follows: (1) Provided that when the danger degree determining device 43 judges that the degree of danger is "low" (Fig. 38C), normal rotative driving of the DC motor 10 is effected for 10 ms, then reverse rotative driving of the same is effected for 10 ms, and then driving of the motor is ~~waited~~ delayed for 30 ms, for example, (2) Provided that when the device 43 judges that the degree of danger is "high" (Fig. 38D), normal rotative driving of the DC motor 10 is effected for 10 ms, and then driving of the DC motor is ~~waited~~ delayed for 10 ms, for example. In this manner, as the degree of danger ~~is higher~~ increases, the duty ~~factor~~ ratio of normal rotative driving and reverse rotative driving of the DC motor 10 is increased, thereby changing the pattern of retraction and protraction of the seatbelt to thereby enable ~~alerting~~ the occupant to be sufficiently alerted to the danger ~~sufficiently~~.

As another variation, the driving of the DC motor 10 may be controlled by the PWM signal as follows: (1) Provided that when the danger degree determining device 43 judges that the degree of danger is "low" (Fig. 38E), normal rotative driving of the DC motor 19 is effected so as to fasten the seatbelt with a force of 10 N, and then reverse rotative driving of the same is effected

so as to release or slacken the seatbelt with a force of 10 N, for example[[,]]. (2) Provided that when the device 43 judges that the degree of danger is "high" (Fig. 38F), normal rotative driving of the DC motor 10 is effected so as to fasten the seatbelt with a force of 20 N, and then reverse rotative driving of the same is effected so as to release the seatbelt with a force of 20 N, for example. In this manner, as the degree of danger is higher, the fastening force and releasing force of the seatbelt by normal rotative driving and reverse rotative driving of the DC motor 10 are increased, to thereby enable ~~alerting~~ the occupant to be sufficiently alerted to the danger ~~sufficiently~~.

As described above, according to the present embodiment, when the danger degree determining device 43 judges that the degree of danger has changed from "low" to "high", (i) the frequency of normal rotative driving and reverse rotative driving of the DC motor 10 is increased, (ii) the duty ~~factor~~ ratio of normal rotative driving and reverse rotative driving of the DC motor 10 is increased, or (iii) the fastening force and releasing force of the seatbelt by normal rotative driving and reverse rotative driving of the DC motor 10 are increased, thereby changing the degree or manner of warning given to the occupant

according to the degree of danger, to thereby enable alerting the occupant to the danger sufficiently.

Please amend the paragraph beginning at page 104, line 28 as follows:

An automotive passenger restraint and protection apparatus according to an eighth embodiment of the invention includes an electric retractor [[800]] which is identical in construction with the electric retractor 100 employed by the first embodiment, except that the bias force-imparting means is omitted, and therefore illustration and description of the same are omitted.

Please amend the paragraph beginning at page 106, line 23 as follows:

The MPU 14 is adapted to change the duty ~~factor~~ ratio of the control signal for driving the DC motor 10 to thereby change the rotational speed of the reel shaft 3.

Please amend the paragraph beginning at page 109, line 33 as follows:

Although in the present embodiment, the driving force of the reel shaft 3 for retracting the seatbelt and the driving force of

the reel shaft 3 for protracting the seatbelt are controlled by changing the duty ~~factor~~ ratio of the control signal for driving the DC motor 10, alternatively these driving forces may be controlled by changing the voltage of the battery Vb, or by providing a variable resistor between the battery Vb and the DC motor 10 and controlling the magnitude of current i flowing to the DC motor 10 by changing the value of the variable resistor.

Please amend the paragraphs beginning at page 110, line 10 as follows:

The ninth embodiment is distinguished from the eighth embodiment described above mainly in the contents of [[th]] the seatbelt attaching control executed by the MPU 14 according to the present embodiment in attaching the seatbelt to the occupant.

The present embodiment includes an electric retractor [[900]] which is distinguished from the electric retractor 100 of the first embodiment only in that a DC motor driver 47 is employed in place of the DC motor driver 11.

Please amend the paragraphs beginning at page 111, line 26 as follows:

Then, it is determined at a step S4706 whether a predetermined time period (e.g. 3 sec) has elapsed. If it has not elapsed, that is, the driving force of the reel shaft 3 for retracting the seatbelt which is progressively decreasing has not yet fully decreased, the processing returns to the step S4705, whereas if the predetermined time period has elapsed, that is, the driving has fully decreased and then the seatbelt has already become fit to the occupant's body and the retraction of the seatbelt has reached its limit, a control signal is delivered from the MPU 14 to the DC motor driver 47 to stop the driving of the DC motor 10 so as to stop the seatbelt retracting driving of the reel shaft 3, at a step [[S4709]] S4707, followed by terminating the program.

Fig. 43 is a timing chart showing an example of the relationship between the driving force of the reel shaft 3 for retracting the seatbelt, the urging force which the occupant receives from the seatbelt, and the seatbelt retracting and protracting speeds of the reel shaft 3.

Please amend the paragraph beginning at page 113, line 8 as follows:

As described above, according to the present embodiment, upon detection of attaching of the seatbelt to the occupant, retraction of the seatbelt is started with a constant magnitude of seatbelt driving force by the reel shaft 3, and thereafter, when the current i flowing to the DC motor 10 exceeds a predetermined amount (e.g., 1.0 ampere), the driving force of the reel shaft 3 for retracting the seatbelt is controlled to progressively decrease, and when the retraction of the seatbelt has reached its limit, a control signal is delivered to the DC motor driver 47 to stop the driving of the DC motor 10. Therefore, the disadvantage with the conventional passenger restraint and protection apparatus, such that the acceleration of the protraction of the seatbelt suddenly increases and even exceeds a threshold value above which the seatbelt becomes locked during protraction, can be eliminated ~~that the acceleration of protraction of the seatbelt suddenly increased and exceeds a threshold value above which the seatbelt becomes locked during protraction~~. As a result, the seatbelt can never be locked during protraction, and therefore the passenger can be released from a state where he receives a large force of oppression, providing a comfortable seatbelt attaching environment.

Please amend the paragraph beginning at page 114, line 9 as follows:

The present embodiment includes an electric retractor [[1000]] which is identical in construction with the electric retractor 100 of the first embodiment.

Please amend the paragraphs beginning at page 117, line 30 as follows:

The eleventh embodiment is distinguished from the ninth embodiment described above mainly in the contents of [[th]] <u>the</u> seatbelt attaching control executed by the MPU 14 in attaching the seatbelt to the occupant.

The present embodiment includes an electric retractor [[1100]] which is identical in construction with the electric retractor [[900]] of the ninth embodiment.

Please amend the paragraphs beginning at page 120, line 33 as follows:

The twelfth embodiment is characterized by seatbelt storing control executed by the MPU 14.[[.]]

The present embodiment includes an electric retractor [[1200]] which is identical in construction with the electric retractor [[800]] of the eighth embodiment.

Please amend the paragraph beginning at page 122, line 16 as follows:

The present embodiment has an electric retractor [[1300]] which is identical in construction with the electric retractor 500 of the fifth embodiment, description of which is therefore omitted.

Please amend the paragraph beginning at page 124, line 4 as follows:

If it is determined at the step S5406 that the seatbelt has been locked during protraction, in order to release the locked state and then give a predetermined looseness to the seatbelt again, the processing returns to the step S5403. [[the]] <u>The</u> driving force employed for the retraction of the seatbelt executed by the step S5403 at this time is set to a larger value than the driving force employed when it is determined that slackening of the seatbelt is needed at the step S5402, in order to release the seatbelt from its locked stated.

Please amend the paragraph beginning at page 126, line 7 as follows:

The electric retractor 1400 includes a DC-DC converter 51, an auxiliary power supply 52, a reverse current blocking device 53, and a vehicle power supply 54 installed in the automotive vehicle, which are connected to the MPU [[1]] 14, but the mode selector 18, the temperature sensor 19 and the traveling condition detector 20 in Fig. 1 are omitted. Further, the electric retractor 1400 does not have bias force-imparting means as employed in the electric retractor 100.

Please amend the paragraph beginning at page 126, line 22 as follows:

The auxiliary power supply 52 which is formed e.g. of a capacitor is connected to the reverse-current blocking device 53 and also connected to the MPU 14 via the DC-DC converter 51. The reverse-current blocking device 53 serves to prevent energy stored in the auxiliary power supply 52 from flowing to the vehicle power supply 54 or to the DC motor driver 11, and permits the energy to be supplied to the MPU 14 via the DC-DC converter 51. The auxiliary power supply 52 stores energy supplied from

the vehicle power supply 54 and supplies the energy over a predetermined time period after stoppage of supply of the energy from the vehicle power supply 54. For example, in the event of a collision of the vehicle, the auxiliary power supply 52 supplies energy stored therein to the MPU 14 over 100 ms, for example, after the collision. The DC-DC converter [[54]] 51 converts output voltage from the vehicle power supply 54 to a voltage value suitable for operation of the MPU 14, e.g. 5 volts.

Please amend the paragraph beginning at page 127, line 24 as follows:

When the seatbelt is protracted, a potential difference is generated between the terminals of the DC motor 10, which corresponds to the protracting speed. The seatbelt locking mechanism 2 ~~locks the seatbelt during protraction using~~ has a WSI (Webbing Sensitive Inertia) function which locks the seatbelt during protraction when the acceleration of protraction of the seatbelt exceeds a predetermined value[[, or a]]. The seatbelt locking mechanism has a VSI (Vehicle Sensitive Inertia) function which locks the seatbelt during protraction when acceleration applied to the vehicle exceeds a predetermined value. The

seatbelt locking mechanism 2 locks the seatbelt only after the reel shaft 3 has rotated in the seatbelt protracting direction by a predetermined amount. On this occasion, the terminal voltage across the DC motor 10 rises along a gradient corresponding to the seatbelt protracting speed and suddenly drops immediately <u>such that</u> the seatbelt is locked during protraction, as shown in Fig. 51. The MPU 14 grasps a waveform of the terminal voltage across the DC motor 10 as shown in Fig. 51, and stores a value of the terminal voltage assumed from a time point 100 ms before the seatbelt is locked during protraction to a time point 100 ms after the seatbelt is locked during protraction, in the EEPROM 49 via the RAM 48 together with the kind of control of the electric refractor 1400.

Please amend the paragraphs beginning at page 138, line 13 as follows:

Then, the MPU 14 determines whether the signal indicative of collision unavoidableness has been received from the collision sensor 55 at a step [[S6502]] <u>S6102A</u>. If the signal indicative of collision unavoidableness has not been received, the processing proceeds to a step S6503. The [[step]] <u>steps</u> S6503 to

~~a step~~ 6509 are identical with the steps S6103 to S6109 in Fig. 56 and therefore description of them is omitted.

If it is determined at the step [[S6502]] S6102A that the signal indicative of collision unavoidableness has been received from the collision sensor 5, that is, if the vehicle has encountered a collision, the processing proceeds to a step S6510. The step S6510 to a step S6515 are identical with the steps S6110 to S6115 in Fig. 56 and therefore description of them is omitted.

Please amend the paragraphs beginning at page 139, line 34 as follows:

The airbag 57 has a plurality of gas generators 59. The pretensioner 58 rapidly winds up the seatbelt to protect the occupant upon a collision of the vehicle and has a plurality of gas generators 60. The pretensioner 58 is coupled to the central shaft [[3s]] 3a of the reel shaft 3 via the reel shaft pulley 5.

Fig. 62 shows the construction of the ~~pretension~~ pretensioner 58. The pretensioner 58 is comprised of a gas chamber-forming member 61 defining therein a gas chamber 61a in which a gas generated from the gas generators 60, not shown in Fig. 62, is enclosed, a pinion 63 coupled to the central shaft 3a

of the reel shaft 3 and [[has]] having an outer periphery thereof formed with a predetermined number of outer teeth~~,~~ and a rack 62 having an end portion thereof formed with inner teeth disposed in mesh with the outer teeth of the pinion 63 and the other end portion slidably fitted in the gas chamber-forming member 61 in a gas-tight manner and defining the gas chamber 61a together with the chamber 61.

Please amend the paragraph beginning at page 143, line 10 as follows:

Further, the airbag and pretension controller 56 calculates a desired value P of the expansion pressure of the airbag 57 and the seatbelt retracting force of the pretension 58, and actuates the gas generators 59 and 60 of the airbag 57 and the pretension 58 based upon the calculated desire value P:

[[T1 = T2 - T1]] T = T2 - T1 ··· (7)

where T2 represents a predetermined value of the actuation times of the airbag 57 and the pretensioner 58.

Please amend the paragraphs beginning at page 146, line 18 as follows:

where b1 and b2 represent a first coefficient and a second coefficient, respectively (b1 > 0 and [[B2]] b2 >0).

Please amend the paragraph beginning at page 146, line 27 as follows:

Then, a desired driving force F of the reel shaft 3 is calculated from the calculated correction value F1 by the use of the following formula (10) and the airbag and pretension controller 56 drives the reel shaft 3 based upon the calculated driving force F, at a step S6908:

[[F = F2 = F1]] F = F2 - F1 ··· (10)

where F2 respresent a predetermined value of the driving force of the reel shaft 3.

Please amend the paragraphs beginning at page 147, line 4 as follows:

To drive the reel shaft 3 with the driving force F, the MPU 14 sets the duty ~~factor~~ ratio of a control signal to be delivered to the DC motor driver 11 to set the terminal voltage across the DC motor 10.

According to the above formula (10), in the event of a strong collision of the vehicle, the calculated correction value

F1 of the driving force of the reel shaft 3 for retracting the seatbelt is small from the above formula (9), and accordingly the calculated desired driving force F of the reel shaft 3 for retracting the seatbelt is large. Therefore, the EA function (a function of causing the reel shaft to rotate in the direction of protracting the seatbelt when a tension in excess of a prescribed value is applied to the seatbelt immediately after a collision of the automotive vehicle, so as to control the tension to or below the prescribed value), which causes the reel shaft to rotate in the direction of protracting the seatbelt when a tension in excess of a prescribed value is applied to the seatbelt immediately after a collision of the automotive vehicle, can operate to protract the seatbelt without being terminated halfway, i.e. at a time point when it is desired that the same function should be still exhibited is reduced by the large driving force F of the reel shaft 3. Thus, the EA function can effectively absorb impact applied to the occupant to thereby properly protect the occupant in the event of a strong collision of the vehicle. On the other hand, in the event of a weak collision of the vehicle, the calculated correction value F1 of the driving force of the reel shaft 3 for retracting the seatbelt is large from the above formula (9), and accordingly the

calculated desired driving force F of the reel shaft 3 for retracting the seatbelt is small. Therefore, the EA function can operate to protract the seatbelt without fail, since a substantial tension applied to the seatbelt is increased by the small driving force of the reel shaft 3. Thus, the EA function can effectively absorb impact applied to the occupant to thereby properly protect the occupant in the event of a weak collision of the vehicle.

Please amend the paragraph beginning at page 150, line 2 as follows:

An automotive passenger restraint and protection apparatus according to an eighteenth embodiment of the invention includes an electric retractor [[1800]] which is identical in construction with the electric retractor 100 except that the bias force-imparting means is omitted, description of which is therefore omitted.

Please amend the paragraphs beginning at page 151, line 1 as follows:

First, to quickly protract the seatbelt in attaching the seatbelt to the occupant's body, a control signal commands rotation of ~~commanding to rotate~~ the DC motor [[210]] 10 in the seatbelt protracting direction at a high speed, i.e., a control signal having a duty ~~factor~~ ratio required for such a high speed rotation, is delivered to the DC motor driver 11 at a step S7001. Responsive to this control signal, the DC motor driver 11 rotates the DC motor 10 at a high rotational speed in the seatbelt protracting direction. The reel shaft 3 then rotates in the seatbelt protracting direction at a high speed in unison with the rotation of the DC motor 10. If the seatbelt locking mechanism 2 is normal, it locks the reel shaft 3 to stop when the latter rotates at the above high speed.

If the detected current i exceeds the predetermined value, that is, the DC motor 10 continues to be energized for rotation with the reel shaft 3 in the locked state, the duty ~~factor~~ ratio of the control signal delivered from the MPU 14 to the DC motor driver 11 is detected at a step S7204.

Then, it is determined at a step S7205 whether the detected duty ~~factor~~ ratio falls within a range between a first predetermined value (e.g. 60 %) and a second predetermined value (e.g. 70 %). This is for determining whether the duty ~~factor~~

ratio of the control signal is included within a range of duty ~~factor~~ ratio within which the duty ~~factor~~ ratio should fall in changing the rotational acceleration of the DC motor 10 from the low degree of rotational acceleration to the desired high degree of rotational acceleration when the seatbelt locking mechanism 2 functions normally.

If it is determined that the duty ~~factor~~ ratio falls within the above range, it is determined at a step S7206 that the seatbelt locking mechanism 2 is normal, followed by terminating the present processing.

On the other hand, if it is determined that the duty ~~factor~~ ratio does not fall within the range between the first predetermined value and the second predetermined value, it is determined at a step S7207 that the seatbelt locking mechanism 2 is abnormal, and then a warning is given to the occupant by means of a display device or a warning light (not shown) to warn him of the abnormality of the seatbelt locking mechanism 2 at a step S7208, followed by terminating the present processing.

Please amend the paragraph beginning at page 151, line 21 as follows:

If the detected current i exceeds the predetermined value, that is, the DC motor 10 continues to be energized for rotation with the reel shaft 3 in the locked state, it is determined at a step S7004 that the seatbelt locking mechanism 2 is functioning normally[[.]], followed by terminating the present processing.

Please amend the paragraph beginning at page 152, line 6 as follows:

First, to slowly protract the seatbelt to give a predetermined amount of looseness to the seatbelt after the seatbelt is attached to the occupant and made fit to his body, a control signal commands rotation of ~~commanding to rotate~~ the DC motor [[210]] 10 in the seatbelt protracting direction at a low speed, i.e., a control signal having a duty ~~factor~~ ratio required for such a low speed rotation, is delivered to the DC motor driver 11 at a step S7101. Responsive to this control signal, the DC motor driver 11 rotates the DC motor 10 at a low speed in the seatbelt protracting direction. The reel shaft 3 then rotates in the seatbelt protracting direction at a low speed in unison with the rotation of the DC motor 10. If the seatbelt locking mechanism 2 is normal, it does not lock the reel shaft 3 when the latter rotates at the above low speed.

Please amend the paragraph beginning at page 154, line 22 as follows:

An automotive passenger restraint and protection apparatus according to a nineteenth embodiment of the invention includes an electric retractor [[1900]] which is identical in construction with the electric retractor [[1800]] of the above described eighteenth embodiment, description of which is therefore omitted. The present embodiment is distinguished from the eighteenth embodiment in the manner of fault diagnosis.

Please amend the paragraph beginning at page 155, line 25 as follows:

First, to quickly protract the seatbelt in attaching the seatbelt on the occupant's body, a control signal <u>commands rotation of</u> ~~commanding to rotate~~ the DC motor [[210]] <u>10</u> in the seatbelt protracting direction at a high rotational speed, i.e. a control signal commanding a change from a low degree of rotational acceleration to a desired high degree of rotational acceleration, is delivered to the DC motor driver 11 at a step S7201. More specifically, the MPU 14 gradually increases the duty ~~factor~~ <u>ratio</u> of the control signal, and responsive to this control signal, the

DC motor driver 11 changes the rotational acceleration of the DC motor 10 from a low degree of rotational acceleration to a high degree of rotational acceleration in the seatbelt protracting direction. The reel shaft 3 then gradually increases in rotational acceleration in the seatbelt protracting direction in unison with the rotational acceleration of the DC motor 10. If the seatbelt locking mechanism 2 is normal, it locks the reel shaft 3 when the rotational acceleration of the reel shaft changes from the low degree of rotational acceleration to the desired high degree of rotational acceleration.

Please amend the paragraph beginning at page 156, line 24 as follows:

Then, it is determined at a step S7205 whether the detected duty ~~factor~~ ratio falls within a range between a first predetermined value (e.g. 60%) and a second predetermined value (e.g. 70%). This is for determining whether the duty ~~factor~~ ratio of the control signal is included within a range of duty ~~factor~~ ratio within which the duty ~~factor~~ ratio should fall in changing the rotational acceleration to the desired high degree of rotational acceleration when the seatbelt locking mechanism 2 functions normally.

Please amend the paragraphs beginning at page 157, line 14 as follows:

If it is determined at the step S7203 that the detected current i is below the predetermined value, that is, the DC motor 10 continues to be energized for rotation with the reel shaft 3 in the unlocked state, the duty ~~factor~~ ratio of the control signal is further increased at a step S7209. Then, it is determined at a step S7210 whether the duty ~~factor~~ ratio of the control signal is the maximum, i.e. 100 %, and if it is the maximum, the processing proceeds to the step S7205, whereas if it is not the maximum, the processing returns to the step S7202.

Fig. 67 shows the relationship between the duty ~~factor~~ ratio of the control signal and time elapsed after the start of delivery of the control signal.

In the figure, a point A represents a duty ~~factor~~ ratio detected at the step S7204 after it is determined at the step S7203 that the detected current i exceeds the predetermined value (e.g. 5 amperes). The duty ~~factor~~ ratio at the point A is 65 % which falls within the range between the first and second predetermined values (60 - 70 %) (the answer is YES at the step S7205). Therefore, in this case, it is determined that the seatbelt locking mechanism 2 is normal (step S7206).

On the other hand, a point B represents a duty ~~factor~~ ratio detected at the step S7204 after it is determined at the step S7203 that the detected current i is below the predetermined value (5 amperes), then the duty ~~factor~~ ratio is increased (step S7209), again the current i is detected (step S7210) and it is determined that the detected current i exceeds the predetermined value. The duty ~~factor~~ ratio at the point B is 80% which falls out of the range between the first and second predetermined values. Therefore, in this case, it is determined that the seatbelt locking mechanism 2 is abnormal (step S7207).

Please amend the paragraph beginning at page 158, line 17 as follows:

First, to slowly protract the seatbelt to give a predetermined amount of looseness to the seatbelt after the seatbelt is attached to the occupant and made fit to his body, a control signal commands rotation of ~~commanding to rotate~~ the DC motor [[210]] 10 in the seatbelt protracting direction at a low speed, i.e. a control signal commanding a change from a high degree of rotational acceleration to a desired low degree of rotational acceleration to a desired low degree of rotational

acceleration, is delivered to the DC motor driver 11 at a step S7401. More specifically, the MPU 14 gradually decreases the duty ~~factor~~ ratio of the control signal, and responsive to this control signal, the DC motor driver 11 changes the rotational acceleration of the DC motor 10 from a high degree of rotational acceleration to a low degree of rotational acceleration in the seatbelt protracting direction. The reel shaft 3 then gradually decreases in rotational acceleration in the seatbelt protracting direction in unison with the rotational acceleration of the DC motor 10. If the seatbelt locking mechanism 2 is normal, it does not lock the reel shaft 3 when the rotational acceleration of the reel shaft changes from the high degree of rotational acceleration to the desired low degree of rotational acceleration.

Please amend the paragraphs on beginning on page 159, line 11 as follows:

If the detected current i is below the predetermined value, that is, the DC motor 10 continues to be energized for rotation with the reel shaft 3 in the unlocked state, the duty ~~factor~~ ratio of the control signal delivered from the MPU 14 to the DC motor driver 11 is detected at a step S7404.

Then, it is determined at a step S7405 whether the detected duty ~~factor~~ ratio falls within a range between a first predetermined value (e.g. 30 %) and a second predetermined value (e.g. 40 %). This is for determining whether the duty ~~factor~~ ratio of the control signal is included within a range of duty ~~factor~~ ratio within which the duty ~~factor~~ ratio should fall in changing the rotational acceleration of the DC motor 10 from the high degree of rotational acceleration to the desired low degree of rotational acceleration when the seatbelt locking mechanism 2 functions normally.

If it is determined that the duty ~~factor~~ ratio falls within the above range, it is determined at a step S7406 that the seatbelt locking mechanism 2 is normal, followed by terminating the present processing.

On the other hand, if it is determined that the duty ~~factor~~ ratio does not fall within the range between the first predetermined value and the second predetermined value, it is determined at a step S7407 that the seatbelt locking mechanism 2 is abnormal, and then a warning is given to the occupant by means of the display device or the warning light to warn him of the abnormality of the seatbelt locking mechanism 2 at a step S7408, followed by terminating the present processing.

If it is determined at the step S7403 that the detected current i exceeds the predetermined value, that is, the DC motor 10 continues to be energized for rotation with the reel shaft 3 in the locked state, the duty ~~factor~~ ratio of the control signal is further decreased at a step S7409. Then, it is determined at a step [[S7210]] S7410 whether the duty ~~factor~~ ratio of the control signal is the minimum, i.e., 0%, and if it is the minimum, the processing proceeds to the step S7405, whereas if it is not the minimum, the processing returns to the step S7402.

Fig. 69 shows the relationship between the duty ~~factor~~ ratio of the control signal and time elapsed after the start of delivery of the control signal.

In the figure, a point C represents a duty ~~factor~~ ratio detected at the step S7404 after it is determined at the step S7403 that the detected current i is below the predetermined value (5 amperes). The duty ~~factor~~ ratio at the point C is 35 % which falls within the range between the first and second predetermined values ~~(60 - 70%)~~ (30 - 40%) (the answer is YES at the step S7405). Therefore, in this case, it is determined that the seatbelt locking mechanism 2 is normal (step S7406).

On the other hand, a point D represents a duty ~~factor~~ ratio detected at the step S7404 after it is determined that the

detected current i exceeds the predetermined value (5 amperes) (step S7403), then the duty ~~factor~~ ratio is decreased (step S7409), again the current i is detected (step S7410) and it is determined that the detected current i is below the predetermined value (5 amperes). The duty ~~factor~~ ratio at the point D is 20% which falls out of the range between the first and second predetermined values. Therefore, in this case, it is determined that the seatbelt locking mechanism 2 is abnormal (step S7407).

Please amend the paragraph beginning at page 161, line 21 as follows:

As ~~describe~~ described above, according to the present embodiment, a control signal which causes ~~commanding to cause~~ a change in the rotational acceleration in the seatbelt protracting direction from a low degree of rotational acceleration to a desired high degree of rotational acceleration is delivered to the DC motor driver 11, the duty ratio of the control signal is detected, and depending upon whether the detected duty ~~factor~~ ratio falls within a range between first and second predetermined values, it is determined whether the seatbelt locking mechanism 2 is normal or abnormal. On the other hand, a control signal which causes ~~commanding to cause~~ a change in the rotational acceleration

in the seatbelt protracting direction from a high degree of rotational acceleration to a desired low degree of rotational acceleration is delivered to the DC motor driver 11, [[,]] the duty ratio of the control signal is detected, and depending upon whether the detected duty ~~factor~~ ratio falls within a range between first and second predetermined values, it is determined whether the seatbelt locking mechanism 2 is normal or abnormal. Since the fault diagnosis is made based upon results of the above two kinds of determinations, accurate fault diagnosis of the seatbelt locking mechanism can be achieved.

Please amend the paragraph beginning at page 162, line 31 as follows:

Although in the above described eighteenth and nineteenth embodiments fault diagnosis of the seatbelt locking mechanism 2 is carried out based upon the current i flowing to the DC motor and the duty ~~factors~~ ratios of control signals delivered to the DC motor driver 11, alternatively fault diagnosis of the seatbelt locking mechanism 2 may be carried out based upon output signals from sensors which sense whether the reel shaft 3 is rotating, whether the reel shaft pulley 5 is rotating, whether the DC motor

pulley 6 is rotating, and/or whether the power transmission belt 7 is operating.

Please amend the paragraph beginning at page 164, line 7 as follows:

An electric retractor [[2000]] provided in a automotive passenger restraint and protection apparatus according to a twentieth embodiment of the invention includes an A/D converter, not shown, and a PWM signal output device, not shown, which are provided in the MPU 14. The A/D converter converts the terminal voltage across the DC motor 10 and current flowing to the DC motor 10 to digital signals, and the PWM signal output device [[65]] delivers a PWM signal for controlling the current flowing to the DC motor to the DC motor driver 11. The terminals P1 to P4 of the DC motor driver 11 in Fig. 2 are connected to the A/D converter [[65]].

Please amend the paragraph beginning at page 164, line 34 as follows:

Except for those described above, the electric retractor [[2000]] is identical in construction with the electric retractor 100, description of which is therefore omitted.

Please amend the paragraphs beginning at page 171, line 10 as follows:

An automotive passenger restraint and protection apparatus according to a twenty-first embodiment of the invention includes an electric retractor [[2100]] which is identical in construction with the electric retractor [[2000]] except that the IFs IF3 and IF4 of the DC motor driver 11 (Fig. 2) do not have capacitors C3, description of which is therefore omitted.

Fig. 72 is a block diagram showing contents of arithmetic processing executed by the MPU 14 according to the present embodiment provided in the electric retractor [[2100]].

Please amend the paragraph beginning at page 172, line 6 as follows:

Next, the operation of these blocks of the electric retractor [[2100]] for calculating the protraction amount or the retraction amount of the seatbelt will be described.

Please amend the paragraph beginning at page 177, line 30 as follows:

In the protraction/retraction amount calculating block 70, the frequency component from the frequency analysis block 75 is multiplied by a predetermined value, [[,]] and the amount of protraction or retraction of the seatbelt is calculated based upon the resulting product and a signal indicative of the detected rotational direction of the DC motor 10 from the motor rotational direction detecting block 72.

Please amend the paragraphs beginning at page 183, line 5 as follows:

Upon receiving a signal indicating that the seatbelt tongue has been released from the buckle, the MPU 14 delivers an ON/OFF control signal having a reference frequency of 20 kHz and a duty ~~factor~~ ratio D expressed by the following formula (12) to the DC motor driver 11 over a predetermined time period (e.g. 3 sec) so as to apply a predetermined supply voltage V to the DC motor 11:

$$D = 100 - a \times T \times x \times r \cdots (12)$$

where a ~~represent~~ represents a control coefficient (e.g. 23.3).

Thus, the predetermined supply voltage is applied to the DC motor in an on-off manner with a frequency corresponding to the duty ~~factor~~ ratio determined by the above formula (12).

Fig. 77 is a timing chart showing the relationship between ON/OFF states of the ignition switch 79 and the duty ~~factor~~ ratio of the ON-OFF control signal delivered to the DC motor driver 11 after release of the seatbelt tongue from the buckle, and Fig. 77A is a graph showing a change in the duty ~~factor~~ ratio of the control signal supplied to the DC motor driver 11 after release of the seatbelt tongue from the buckle to the time the predetermined time period (3 sec) elapses.

As shown in Fig. 77A, the duty ~~factor~~ ratio of the ON/OFF control signal delivered to the DC motor driver 11 is progressively decreased with elapsed time T after release of the seatbelt tongue from the buckle according to the formula (12).

Thereafter, as shown in Fig. 77, the MPU 14 sets and holds the duty ~~factor~~ ratio to and at 0 % for 1.9 seconds, and then sets and holds the duty ~~factor~~ ratio to and at 30 % for 0.1 seconds, followed by again setting and holding the duty ~~factor~~ ratio to and at 0 % for 1.9 seconds. In this way, the ON/OFF control signal is delivered to the DC motor driver 11 with the duty ~~factor~~ ratio cyclically changing in a cycle of 2 seconds.

By the above control of the duty ~~factor~~ ratio, supply voltage which gradually decreases in response to the ON-OFF control signal having a duty ~~factor~~ ratio progressively decreased from 100 % to 30 % with the lapse of time for a first predetermined time period (3 sec) after release of the seatbelt from the buckle, and then, no supply voltage is applied to the DC motor 10 for a second predetermined time period (1.9 seconds), then the supply voltage is applied to the DC motor 10 at a voltage corresponding to the duty ~~factor~~ ratio of 30 % of the ON/OFF control signal for a third predetermined time period (0.1 seconds), and then again no supply voltage is applied to the DC motor 10 for the second predetermined time period (1.9 seconds), and thereafter the same cyclic control of the supply voltage is repeated.

Please amend the paragraphs beginning at page 184, line 27 as follows:

As described above, according to the present embodiment, the MPU 14 controls the duty ~~factor~~ ratio of the ON/OFF control signal delivered to the DC motor driver 11 in such a cyclic manner that the supply voltage V of a predetermined value is applied to the DC motor 10 in an on-off manner with a frequency corresponding to the duty ~~factor~~ ratio of the control signal which is progressively

decreased for a first predetermined time period (e.g. 3 seconds) as time elapses after release of the seatbelt tongue from the buckle, then set to and held at a predetermined low duty ~~factor~~ ratio (e.g. 0 %) for a second predetermined time period (e.g. 1.9 seconds), and then set to and held at a predetermined high duty ratio (e.g. 30 %) for a third predetermined time period (e.g. 0.1 seconds), and thereafter the same cyclic control of the duty ~~factor~~ ratio is repeated with a cycle of 2 seconds, for example. As a result, the seatbelt can be slowly brought into a retracted position, while eliminating the above-mentioned disadvantage with the conventional apparatus.

Please amend the paragraph beginning at page 186, line 2 as follows:

Simultaneously upon turning-off of the ignition switch 79, the MPU 14 delivers a high-level signal to the base of the transistor 78 to turn the same on, whereby supply voltage from the battery 80 is supplied via the transistor 78 to the electric retractor 100, MPU 14, buckle connection detector 16, and temperature sensor [[17]] 19.

Please amend the paragraph beginning at page 187, line 13 as follows:

An automotive passenger restraint and protection apparatus according to a twenty-seventh embodiment of the invention includes an electric retraction [[2700]] which is identical in construction with the electric retractor, description of which is therefore omitted.

Please amend the paragraphs beginning at page 195, line 15 as follows:

An automotive passenger restraint and protection apparatus according to a thirtieth embodiment of the invention includes an electric retractor [[3000]] which is an improved version of the electric retractor 100 and includes each one pair of reel shaft pulleys, motor pulleys, power transmission belt, DC motors, and DC motor drivers.

Fig. 81 shows the arrangement of the electric retractor [[3000]].

The seatbelt retractor [[3000]] has a frame 101 in which is rotatably mounted a reel shaft (takeup shaft) 103 for retracting and protracting a seatbelt. Secured to an end of the reel shaft 103 is a known seatbelt locking mechanism 102 which is adapted to

lock or stop the seatbelt from being protracted when a predetermined or higher degree of deceleration is applied to an automotive vehicle in which the present apparatus is installed or when the seatbelt is protracted at a predetermined or higher degree of acceleration.

Please amend the paragraph beginning at page 197, line 8 as follows:

The MPU 110 has a built-in timer 120 for measuring time. Connected to the MPU 110 are a buckle connection detector [[162]] 112 which detects whether the seatbelt has been attached to the buckle or disconnected therefrom and delivers a signal indicative of results of the detection to the MPU 110, and a collision predictor 111 which predicts a possible collision of the vehicle.

Please amend the paragraphs beginning at page 197, line 28 as follows:

where Vr represents relative speed (m/sec)[[,]] and td response delay of the driver ~~e.g. 0.5 to 2 sec.)~~ (e.g. 0.5 to 2 sec.).

Please amend the paragraphs beginning at page 197, line 32 as follows:

First, when the first DC motor 108 is energized or rotatively driven while the second DC motor 116 is kept deenergized in a non-driven state, the reel shaft 103 is rotated by the rotating first DC motor 108 and the second DC motor 116 is caused to rotate in unison with the rotation of the reel shaft 103. On this occasion, since the gear ratio between the first reel shaft pulley 105 and the first DC motor pulley 106 is set to the same value as the gear ratio between the second reel shaft pulley 113 and the second DC motor pulley 114[[.]] , the rotational speed of the first DC motor 108 which is rotatively driven is the same as the second DC motor 116 which is not energized for rotation.

Please amend the paragraph beginning on page 198, line 12 as follows:

While the first DC motor 108 is energized to be rotatively driven and the second DC motor 116 is not energized for rotation but merely rotated in unison with the rotation of the reel shaft 103, if the seatbelt is protracted by the occupant, the MPU 110 compares the C motor terminal voltage or pulsating components contained therein between the first DC motor 108 and the second DC

motor 116, and if the compared terminal voltage or pulsating components are equal between the first and second DC motors, the MPU 110 determines that the electric retractor [[3000]] is normal, but if they are not equal, the MPU 110 determines that there is an abnormality in the electric retractor [[3000]]. The gear ratio between the first reel shaft pulley 105 and the first DC motor pulley 106 may be set to a different value from the gear ratio between the second reel shaft pulley 113 and the second DC motor pulley 114. In this case, by using a correction coefficient or the like dependent upon the difference in gear ratio, the same fault diagnosis as above can be carried out.

Please amend the paragraph beginning at page 199, line 29 as follows:

Assuming that the maximum value of the driving force for retracting the seatbelt that is required when the signal indicative of a collision being unavoidable from the collision predictor 111 <u>is</u> received by the MPU 110 is [[100]] <u>100 N</u>, the maximum value of the driving force of each of the first and second DC motors may <u>be</u> set to [[70]] <u>70 N</u>. Then, the maximum value of the combined driving force of the first and second DC motors 108 and 116 exceeds [[100]] <u>100 N</u>, and therefore, then the respective

driving forces of the first and second DC motors 108, 116 have only to be adjusted so that the maximum value of the combined driving force becomes equal to [[100]] 100 N. The first and second DC motors 108, 116 can be designed to be compact in size and light in weight and manufactured at a low cost.

Please amend the paragraphs beginning at page 200, line 8 as follows:

Further, for example, if the first DC motor 108 has a degraded driving force due to aging change or the like, the ratio of driving force between the first and second DC motors 108, 116 may be changed by adjusting the pulse width of at least one of the PWM signals delivered to the respective DC motor drivers 109, 117 by the MPU 110 so that the ratio of driving force of the second DC motor 116 which is larger than that of the first DC motor 108 can be utilized to the fullest extent. For example, if the maximum value of the driving force of the first DC motor 108 has decreased to [[30]] 30 N, the driving force of the second DC motor 116 is set to the maximum value of [[70]] 70 N when the signal indicative of a collision being unavoidable from the collision predictor 111 is received, to thereby enable securing a driving force required for retracting the seatbelt.

Please amend the paragraphs beginning on page 199, line 29 as follows:

Assuming that the maximum value of the driving force for retracting the seatbelt that is required when the signal indicative of a collision being unavoidable from the collision predictor 111 is received by the MPU 100 is [[100]] 100N, the maximum value of the driving force of each of the first and second DC motors may be set to [[70]] 70 N. Then, the maximum value of the combined driving force of the first and second DC motors 108 and 116 exceeds [[100]] 100 N, and therefore, then the respective driving forces of the first and second DC motors 108, 116 have only to be adjusted so that the maximum value of the combined driving force becomes equal to [[100]] 100N. The first and second DC motors 108, 116 can be designed to be compact in size and light in weight and manufactured at a low cost.

Further, for example if the first DC motor 108 has a degraded driving force due to aging ~~change~~ or the like, the ratio of driving force due between the first and second DC motors 108, 116 may be changed by adjusting the pulse width of at least one of the PWM signals delivered to the respective DC motor drivers 109, 117 by the MPU 110 so that the ratio of driving force of the second DC motor 116 is larger than that of the first DC motor 108, whereby

the driving force of the first DC motor 108 can be utilized to the fullest extent. For example, if the maximum value of the driving force of the first DC motor 108 has decreased to [[30]] 30 N, the driving force of the second DC motor 116 is set to the maximum value of [[70]] 70 N when the signal indicative of a collision being unavoidable from the collision predictor 111 is received, to thereby enable ~~securing~~ a driving force required for retracting the seatbelt.